Dados Obtidos:

i	1	2	$\cdots$	n
$f(x_i)$	$f(x_1)$	$f(x_2)$	$\cdots$	$f(x_n)$
x_i	x_1	x_2	$\cdots$	x_n

Função que queremos aproximar:

$$f(x_i) \cong g(x_i)$$

$$f(x_i) \cong a_0 * g_0(x_i) + a_1 * g_1(x_i) + \cdots + a_m * g_m(x_i)$$

Após vários passos (veja o livro se quiser) chegamos em:

$$\begin{bmatrix} \sum_{i=1}^{n} g_0(x_i)g_0(x_i) & \sum_{i=1}^{n} g_0(x_i)g_1(x_i) & \cdots & \sum_{i=1}^{n} g_0(x_i)g_m(x_i) \\ \sum_{i=1}^{n} g_1(x_i)g_0(x_i) & \sum_{i=1}^{n} g_1(x_i)g_1(x_i) & \cdots & \sum_{i=1}^{n} g_1(x_i)g_m(x_i) \\ \vdots & \vdots & & \vdots \\ \sum_{i=1}^{n} g_m(x_i)g_0(x_i) & \sum_{i=1}^{n} g_m(x_i)g_1(x_i) & \cdots & \sum_{i=1}^{n} g_m(x_i)g_m(x_i) \end{bmatrix} * \begin{bmatrix} a_0 \\ a_1 \\ \vdots \\ a_m \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^{n} g_0(x_i)f(x_i) \\ \sum_{i=1}^{n} g_1(x_i)f(x_i) \\ \vdots \\ \sum_{i=1}^{n} g_m(x_i)f(x_i) \end{bmatrix} \rightarrow$$

$$\begin{bmatrix} a_0 \sum_{i=1}^{n} g_0(x_i)g_0(x_i) + a_1 \sum_{i=1}^{n} g_0(x_i)g_1(x_i) + \cdots + a_m \sum_{i=1}^{n} g_0(x_i)g_m(x_i) \\ a_0 \sum_{i=1}^{n} g_1(x_i)g_0(x_i) + a_1 \sum_{i=1}^{n} g_1(x_i)g_1(x_i) + \cdots + a_m \sum_{i=1}^{n} g_1(x_i)g_m(x_i) \\ \vdots \\ a_0 \sum_{i=1}^{n} g_m(x_i)g_0(x_i) + a_1 \sum_{i=1}^{n} g_m(x_i)g_1(x_i) + \cdots + a_m \sum_{i=1}^{n} g_m(x_i)g_m(x_i) \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^{n} g_0(x_i)f(x_i) \\ \sum_{i=1}^{n} g_1(x_i)f(x_i) \\ \vdots \\ \sum_{i=1}^{n} g_m(x_i)f(x_i) \end{bmatrix}$$

Que leva em um sistema com m variáveis

Exemplo:

i	1	2	3	4
$f(x_i)$	0	2	4	6
x_i	5.3	7.0	9.4	12.3

Note:

$$g(x_i) = ax_i + b$$
$$g(x_i) = a_0 x_i + a_1$$
$$g(x_i) = a_0 * x_i + a_1 * 1$$

Então:

$$g(x_i) = a_0 * x + a_1 * 1$$
$$g(x_i) = a_0 g_0(x_i) + a_1 g_1(x_i)$$
$$g_0(x_i) = x_i \qquad g_1(x_i) = 1$$

Função escolhida pra aproximar:

$$f(x_i) \cong g(x_i)$$

$$f(x_i) \cong a_0 * g_0(x_i) + a_1 * g_1(x_i)$$

$$g_0(x_i) = x_i \qquad g_1(x_i) = 1$$

Substituindo e Aplicando o método:

$$\begin{bmatrix} a_0 \sum_{i=1}^{n} g_0(x_i) g_0(x_i) + a_1 \sum_{i=1}^{n} g_0(x_i) g_1(x_i) \\ a_0 \sum_{i=1}^{n} g_1(x_i) g_0(x_i) + a_1 \sum_{i=1}^{n} g_1(x_i) g_1(x_i) \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^{n} g_0(x_i) f(x_i) \\ \sum_{i=1}^{n} g_1(x_i) f(x_i) \end{bmatrix} \rightarrow$$

$$\rightarrow \begin{bmatrix} a_0 \sum_{i=1}^{4} x_i x_i + a_1 \sum_{i=1}^{4} x_i * 1 \\ a_0 \sum_{i=1}^{4} x_i * 1 + a_1 \sum_{i=1}^{4} 1 * 1 \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^{4} x_i * f(x_i) \\ \sum_{i=1}^{4} 1 * f(x_i) \end{bmatrix} \rightarrow \begin{bmatrix} a_0 \sum_{i=1}^{4} x_i^2 + a_1 \sum_{i=1}^{4} x_i \\ a_0 \sum_{i=1}^{4} x_i + a_1 \sum_{i=1}^{4} 1 \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^{4} x_i * f(x_i) \\ \sum_{i=1}^{4} f(x_i) \end{bmatrix}$$

$$\rightarrow \begin{bmatrix} a_0(316,74) + a_1(34) \\ a_0(34) + a_1(4) \end{bmatrix} = \begin{bmatrix} (125,4) \\ (12) \end{bmatrix} \rightarrow \begin{cases} a_0(316,74) + a_1(34) = (125,4) \\ a_0(17) + a_1(2) = (6) \end{cases} \rightarrow$$

$$\rightarrow \begin{cases} a_0(316,74) + a_1(34) = (125,4) \\ a_1 = (3) - a_0(8,5) \end{cases} \rightarrow a_0(316,74) + (102 - 289a_0) = (125,4)$$

$$\rightarrow a_0(27,74) = (23,4) \rightarrow a_0(0,84354 \ldots)$$

$$\rightarrow a_1 = (3) - a_0(8,5) = 3 - 7,1070 \ldots = -4,170151406 \ldots$$